

AN ALTERNATIVE METHOD FOR ESTIMATING A THRESHOLD POINT OF TEMPERATURE IN A PIECEWISE LINEAR REGRESSION MODEL USING KOREAN DATA

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Background and Aims: Due to U-, V-, or J-shaped pattern of temperature effects, a threshold effect on mortality has been researched using a piecewise linear regression model (PLRM) by fitting left and right slopes based on the smallest Akaike information criterion (AIC). However, in Korean data, the estimated threshold was higher than a point shown on a smoothing spline plot. We experimentally applied an alternative method to find better estimate of a threshold.

Methods: We evaluated meteorological and mortality data from 6 metropolitan areas in Korea from 1992 to 2009. Smoothing spline plots were drawn using a generalized additive model (GAM). We applied PLRM for quantifying the estimated threshold point of temperature on mortality. In GAM and PLRM, relative humidity, air pressure, day of the week, and seasonal and long-term trends were controlled for. Instead of using the AIC, we selected a threshold point based on the smallest left slope estimate (LSE) of the nonlinear associations.

Results: The threshold based on the LSE was lower than the one using the AIC. In Seoul, the threshold temperature was 26°C and 28.4°C, in Incheon; 25.2°C and 28°C, in Daegu; 27°C and 28.6°C, and in Gwangju; 23.4°C and 25°C based on the LSE and the AIC, respectively. Two other cities (Daejeon and Busan) showed diverged estimates of the threshold based on the AIC. Consequently, the threshold based on the LSE showed closer to the point on the smoothing spline plot.

Conclusions: The study demonstrated that the estimated threshold based on the LSE was closer to the smoothing spline plot and was lower than the one based on the AIC. However, the experimental study may need to be elaborated in mathematical logic.

Reference

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